The night, the music: a cognitive hypothesis

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Abstract: In this article I present a discussion, based on cognitive psychology and on philosophy, about the application of the metaphor 'music as play,' instead of the metaphor 'music as language.' In it I try to distinguish what is properly biological in our hearing system from what is cultural, in order to emphasise, firstly, the hypothesis that music represents the creation of a territory of comfort where sounds are placed in places in which, according to the rules of a game, of a cognitive puzzle, they should be — a hypothesis that points to music as art; and, secondly, the idea that cognition of music may be understood as an enlarged auditory scene analysis, based on categorisation, rhythmicalization, and recursive schemes of sounds. This makes possible the building of a capacity to judge the rules of the game of music according to their latent potential and to their functionality; and, not least, to judge how well the creator "plays" the game, because in music (distinctly from the language) a conventional relationship with the world is superfluous, the rules are transmitted to those who attend by the very act of playing the game. As the specific context is not cultural, but that of the game itself, the determination of a great move in play does not depends on a class hegemony, but only on Kantian disinterest.

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In ancient Greece and Rome, and thereafter during the whole of European middle ages, Music participated in the perfections of the Number and of the Universe. And thus it remained, studied together with Arithmetic, Geometry and Astronomy until the Renaissance. It was at this moment that music started to be understood in the field of studies stemming from the language, the studies of human imperfections, the *trivium*: Grammar, Rhetoric, and Philosophy. This fact led Western music to manifest a huge enlargement of its possibilities and has given birth to many of its developments, but it is not ontologically necessary to do so. In other words, the metaphor "music as language" was much more useful as an impulse given to several poetics of music, than it is to understand its nature.

To deal with music as a "language", as it happens also with the other arts, brings a modern difficulty: language presupposes inevitably the sharing of references to the world, and today, for historical and sociological reasons, we expect each music, if it is to be *art music*, to have a unique set of rules and sonority (which is a consequence of the former) — we expect it to create its very own sonic world. Although composers must bluntly discard the possibility, which is no option at all, of fencing the future inside a museum of past music, and to assert that musical art is unavoidably destined to wither away in a motionless decadence, beating the listener, as the vanguard did, does not seem much better than serving him stale music. In fact, a lot of the irascibility of the vanguard music of recent past, that regarded whoever hears it as an adversary to be conquered, was a result of this faith that for someone to grasp a piece of music it would be necessary to enforce an understanding of its "language".

However, as it is obvious from the fact that humans have always created art with a *monumental* character (that is, art that was created also for a public in a future society that would share with the artist nothing in common *but the art object itself*), the worlds created by art are not split by distinct languages, whose mutual incomprehension would prevent us from acknowledging the eventual beauty of objects belonging to territories we do not inhabit. If it were so, Debussy would not have suffered the impact caused to him by the beauty of the Javanese gamelan music — a music whose theoretical and social bases are absolutely far-flung from European ones — in the 1889 World Exhibition in Paris, impact that echoed throughout all 20th-Century music, until today. It is that possibility of "displacement" of art, in this very restrict sense, that makes it necessary to look for a different philosophical model for the creation of music.

"Élire domicile dans le nombre"

> I suggest, then, that we turn it around. Instead of using what we can guess at about the nature of thought to explain the nature of music, start over again. Begin with music and see what this can tell us about the sensation of thinking. Music is the effort we make to explain to ourselves how our brains work. We listen to Bach transfixed because this is listening to a human mind. The Art of the Fugue is not a special pattern of thinking, it is not thinking about any particular thing. ... it is about thinking ... it's the sound of the whole central nervous system of human beings, all at once. (Thomas 1979, 223-4).

In 1997, I read a short book by William H. Calvin, *How Brains Think* (1996). It was my first contact with cognitive studies. In it I was especially interested in the discussion about how our minds categorise information and memorise it as the basis for consciousness, and the limits of those processes. It seemed to me that they could serve as universal benchmarks for judging musical creation within the modernist mandate expressed by Baudelaire (1885, 64) as '*épouser la foule*', either in the literal connotation of the verb '*épouser*', of marrying, or in the most sensual connotation, of embracing something, led by the senses. I believe Baudelaire's imperative to be, in the modern maelstrom of destruction and renewal, a feasible presentation of the necessary reverse of the Kantian concept of genius, so often overlooked in recent art: "genius is a talent for producing that for which no definite rule can be given (...), but since there may also be original nonsense, its products must at the same time serve as models, that is, they must be exemplary" (Kant 1790/1991, 168). In other words, while the genius depends on a representation of the Will, exemplarity would derive from a skill of the spirit. And a judgment stemming from our communion of cognitive capacities could ideally aim at universality; in this way, the third aspect of Kantian aesthetics, Nature, could be sought in the intimate nature of our minds.

But cognitive studies are based on ideas — the mind as a computer, the ascending symbolic levels from the senses, the evolutionary biological model applied to culture — which, it seems to me, are increasingly understood by researchers not as metaphors, but as the very assumptions of studies of the mind. I, on the other hand — from my background as a palaeontologist (in addition to being a musician) — see with great suspicion the transferring of Darwinian evolutionary assumptions, naively and directly, into the field of culture (as, for example, Richerson and Boyd did (1985 and 2004)). For sure, the evolution of any aspect of culture is not Darwinian.

Confusion is evident, for example, in works such as *The Selfish Gene*, in which Richard

Dawkins coined the term *meme* for cultural patterns in analogy to genes. In fact, the first of the six necessary properties for the Darwinian theory is the existence of patterns. The other are: second, somehow copies of this pattern are made — the cells divide, people whistle melodies they hear. Third, that these patterns eventually change — the mutations. Fourth, that there is a competition between copies to occupy a limited environmental space — and at this point Dawkins's theory begins to flaw, the analogy becomes forced, because it does not take into account human Will. Fifth, the relative success of variants is influenced by a varied environment, which selects gene reproduction or survival — the natural selection. Finally, the next generation depends on which variants survive until they reproduce, and it is the variants that are successful then, and not at the moment of conception, upon which depends the principle of inheritance (taken from Mendel — Calvin 1996, 104-5) in modern Darwinism. Of course, analogies could be conceived between the last three of the properties necessary for evolutionary theory and music — as one might describe "evolutionarily" even a pincher dog — and thus go further with the gene/meme metaphor: but it would always be a metaphor.

The dialectical relationship of musical processes with history is unavoidable, and history is not evolution. Human culture is, as it were, Lamarckian: a giraffe, we know, does not transmit to its offspring its neck lengthened by the effort it had made to reach ever higher branches; but if a human generation reaches out and arrives at the moon, so can successive generations. Still, on the other hand, it is certainly possible, starting from cognitive studies, to locate in elements of the biological functioning of human mind data for the understanding of musical processes, especially those of creativity.

The sense of fear in a territory of comfort

> Night and music — The ear, organ of fear, could have evolved as greatly as it has only in the night and twilight of obscures caves and woods, in accordance with the mede of life of the age of timidity, that is to say the longest human age there has ever been: in bright daylight the ear is less necessary. That is how music acquired the character of an art of night and twilight. (Nietzsche, 1881/1997, § 250, 143)

My first hypothesis can be summarised as follows: evolution certainly did not give us the sense of hearing to hear music; as with all animals upwards from reptiles, the basic function of hearing is to

watch. Any attempt to use the cognitive sciences to understand music must clearly distinguish what are biological abilities of man, applicable to music, from music itself, and therefore culture.

In fact, there are two distinct routes of the auditory signal (as well as of the visual) in the brain. An ancient and very fast, that goes directly to the amygdaloid nucleus, and is bound to basic survival functions, that David Huron (2005) associates with emotional responses to music. Huron, following Leonard Meyer's information-based theory (1956), tried to adapt it to the terms of neurology and cognitive sciences. But the leap he makes, describing the feeling of musical expectation in terms of distinct response systems (by *reaction*, which would be defensive reflexes; by *tension*, whose uncertainty would lead to stress; by *prediction*, which would reward accurate prediction with dopamine; by *imagination*, which would facilitate the postponement of gratification; by *valuation*, which would occur after conscious thought has taken part), blends innumerable neurological properties in an attempt to engender a unified theory. Even though Huron admits that the various responses would in practice produce a complex mix of feelings, he ends — as Massey (2009, 7) criticises him — without offering a single hypothetical example of this imagined process, or what its results would be like. Among the distinct response systems proposed by Huron, only two — by reaction and by tension — concern the amygdaloid nucleus, which is the brain's main structure for emotional response. The rest depend on the auditory signal being routed through neocortical structures, that is, through the evolutionarily recent — and subject to awareness — paths.

With a simple mental experiment, in which we see the auditory system functioning independently of cultural superstructures, we may infer a number of hypotheses useful for understanding music. Imagine you spent a day preparing a party at home; the party is very lively, with many guests, but at a certain moment of the night, tired, you lean back on a bed and nap. The party goes on. After a while, a plate drops in the kitchen (someone decided to start washing the dishes) and breaks. Second scenario: imagine yourself sleeping alone at home. There are not even cats. In the middle of the night, a plate falls in the kitchen and breaks. What can be deduced from the obviously different emotional reactions to the two events?

First, we can imagine that the kind of reaction, originating in the amygdaloid nucleus, of running away or confronting, at the startled awakening in the empty house, would be no different from that of many inferior animals. A gecko, *mutatis mutandis*, would have an identical reaction.

Ergo, the distinct structures that we impose on the occurrences of the two events are of necessity pre-thought, that is, prior to reason. They cannot therefore be based, as Descartes wanted, on a *res geometrica*, or, as so many others want, on a structure provided by language. Secondly, it is not the intrinsic quality of the sound, its *qualia*, that gives rise to different emotional responses, but those proto-rhythmic structures that we impose on the world to give an order to the informational noise.[1]

Thirdly, the different layers of auditory perception, from which individual events stand out or not, are independent of whether we consciously perceive them (the experiment does not take place in the wake). Fourthly, the link between perceived auditory phenomena and the world, which will give rise to the most direct semantics, to the unmediated relationship between expressions and referents, derives already from this indicating facts of the world directly (such as when we hear our name being called — its meaning is already a *catachresis*, as we shall see, of the affect given to the sound perceived).

Fifthly, the speed of the path to the amygdaloid nucleus and its plasticity to experience, fundamental to survival, explain the almost immediate remission of music to simple affects. Hence, for example, the immediacy of the phenomenon "oh dear, they are playing our music": listening again to a song that was heard at a particular event that was an emotionally remarkable experience, or at an important stage in a relationship, will trigger memories of that event throughout life. It is an effect similar to that of the "Proustian madeleine", because the olfactory system also has a short subcortical route to the amygdaloid nucleus (which in lower mammals is even more important than the auditory system). The plasticity of the amygdaloid nucleus to experiences, which engender permanent changes in the strength, or *efficacy*, of synapses that happen with certain patterns of neural stimulation, give rise to spontaneous emotional remissions to the world, mechanisms which should not be considered identical to those of memory (unless this is understood in a very broad sense).

However, sixthly, this correlation between event and world, either individual or collective it may be, is of course — unlike language — *unnecessary* and even detrimental to the cognition of

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[1] Also in Japanese musical theory, that finds "more meaning in listening to the innate quality of sound rather than in using sound as a means of expression" (Takemitsu 1995, 57) —, the notions of *ma*, the unsounded part of the sonic experience, the point of intense silence that precedes a complex, refined sound giving life to it (id., 51) — and of *sawari*, the intentional obstacle that is potentially creative and gives origin to the complexity and expressivity of a sound (id., 65), are already proto--rhythmical.

music. It represents what Jos Kunst (1978, 4.6.0) rightly called "the collapse of music into language": the song to be understood does not depend on "being ours," and *"being ours" may even prevent us from understanding it.*

As a corollary of these six inferences, I distinguish two paths of inquiry. The first, derived from the idea that music is the creation of a *territory of comfort* where — unlike in nature where they give rise to fear; Nature is chaos — sounds are placed in places in which, according to the rules of a game, of a cognitive puzzle, they should be. There is a coincidence with Gadamer about territories being originated by *play* as this is transfigured into form. And play, as thought not reducible to knowledge, has at least two important characteristics: *freedom* (music as territory opens the way for its critique, since territories are inclusive/exclusive) and the *emotional co-involvement.* Thus, the object-music can be studied, socially and anthropologically, as an artificial territory, constructed and heard as boundaries that are created to include or exclude people, as if each territory delimited by music were a heterotopy (Foucault 1994, 752-62), a type of contestation, simultaneously mythical and real, of the space where we live, that has the function of reserve of imagination. Hence the importance of the "inaugural" character of the music that one wants to be artistic: in the "presentation of various possibilities of existence which, while not claiming to stand as a utopian *telos* or criterion for judgment upon that which already exists, still function by making it fluid and suspending its exclusivity and cogency." (Vattimo (1985/1988, 75), who relates the inaugurality to the thinking of Ricœur and Dilthey.) As Vattimo insists, this inaugurality of art must be conceived of in the sense of "founding", of configuring possible historical worlds, alternative to the existing world. And this, "even if this alternative is recognised as a pure utopia," gives music an ideal meter as a criterion for judgment.

The music before consciousness: the world as the roar of the sea

The second direction of investigation is to seek a deeper knowledge of the prior structures that would enable musical cognition. In the preface to the *New Essays*, Leibniz says that there are "at every moment an infinite number of perceptions in us, but without apperception and reflection, i.e. changes in the soul itself of which we are not conscious, because the impressions are either too slight and too great in number, or too even, so that they have nothing sufficiently distinguishing

them from each other." (Leibniz 1768/1981, 53). In Leibniz's view, instead of the *res geometrica* in the Cartesian theory of mind, an awakened human being is aware of particular but not of all perceptions; yet the mind is always active, and even in deep, dreamless sleep there is in the mind a synchronic infinity of perceptions. The world is filled with informational white noise — the *petites perceptions*, which Leibniz associated with the roar of the sea: "to understand this noise as it is made," says Leibniz, "it would be necessary to hear the parts which compose this whole, that is, the noise of each wave, although each of these little noises makes itself known only in the confused collection of all the others, i.e. in the roar itself, and would not be noticed if the wave which makes it were alone."(Leibniz 1768/1981, 48).

Note that Leibniz's example is aural; "The sound space seems to include, alongside an element of succession, an element of simultaneity". (Brelet 1949, 11). The hypothesis takes from here on a twofold assumption: that music is perceived in a way that was developed from the perceptual mechanism for the recognition of sounds, in what is called "auditory scene analysis"; and that there is an important difference between the sound gestures actually perceived — that reach the emotional centre of the brain — and the memory of sounds, in musical imagination.

Similarly to what Bregman described in his "Auditory Scene Analysis: hearing in complex environments", it is certain that we activate purely automatic learned schemes — common to all in a shared culture — when music reaches our ears (Bregman 1992, 14). It is also true that we try to impose these same schemes, in a way in which voluntary attention is needed, on music unknown to us. But it would be easy to assume that we have general methods for music perception that would be used even before any specific knowledge, similar to what Bregman calls "primitive auditory scene analysis", which is "primitive" in the sense that it depends on the general acoustic properties of sounds and the pattern-making skills of our cognitive system. Here Bregman follows Roger Shepard (1981, *passim*) in suggesting that, by a process called 'psychophysical complementarity', the regularities of the physical world have led the evolutionary process to fine tune our perceptual system. Thus, when confronted with an unknown music scene, we would look for regularities both within individual sounds ("auditory scene analysis" properly) and in the relationships — symmetries and asymmetries — between them.

The idea that a theoretical model for music should be based on symmetries and asymmetries is very old. Plato followed Pythagoras in suggesting that the artist discovers the symmetry that

nature — according to some inherent mathematical idea — endowed his creatures, and then copies and refines, in imperfect achievements, what nature had presented him. Edgard Alan Poe (1850/1909, 270) has suggested that the perception of pleasure in the equality of sounds is the principle of music, an idea of *equality* that embraces those of similarity, proportion, identity, repetition, and adaptation or fitness. A pleasure similar to that we have when examining a crystal. All current formalist theories of music are postulated of "equalities" (for example, Allan Forte's, where symmetries are incorporated into pitch sets).

Note, however, that symmetry here does not assume geometric thinking. In music, symmetry is merely an analogy: "No matter how exact the symmetries imposed on paper to a musical work, they are deformed by the duration in which they are inserted, and subject to the asymmetry of past and future that constitute music" (Brelet 1949, 13). There is no symmetry in time: "I consider the concept of successive symmetry a *non sense*," says Meumann (1894, 15). To speak of symmetry in time is an effect of the confusion of the visual scheme of written rhythm with living rhythm, which, flowing in duration, is essentially rebellious to symmetry (Brelet 1949, 12). It would not be an unreasonable philosophical step to argue that, because we live in time, the brain knows only rhythmic frequencies and ratios, and that a geometrical thinking presupposes a rhythmic thinking.

In nature there are asymmetries that are perceived as necessary. For example, those caused to animals by gravity or movement. Or the multiple partial frequencies of a fundamental that make us hear a sound as being harmonic. Poetics that contradict these *necessary asymmetries* make the object to be perceived as grotesque, which may, or may not, play a role in a given aesthetic function. However, for most formalist music theories, the past and the future are interchangeable, just as the laws of nature are invariant with respect to the inversion of time. Indeed, to anyone who writes music, the past and the future seem to be equally knowable and changeable by decisions made *now*. Nevertheless, while the sounds in memory depend on a complex system of sound imagination, sounds that come through our ears reach us by way of the amygdaloid nucleus, in the limbic system of our brains, which is, as it was argued, responsible for emotions, and it is easy to conceive of a difference in emotional impact between imagining a piece of music and actually listening to it.

Moreover, when music is mediated to the amygdaloid nucleus by the shortest subcortical route, it is probably even beyond the control of consciousness. This is a continual distortion of musical symmetries, because repetitions by music in the dimension of time, the principle of

rhythm, are always repetitions of unequals. It is from this non-arbitrary asymmetry, which takes place among the various memory systems, that results the formal dissonance in music, i.e., its expressive content.

There is here, however, another conceptual difficulty. There are also natural asymmetries that are arbitrary, such as the right-handed/left-handed pair. Similarly, there are *arbitrary asymmetries* in music, such as tonality. What matters is that it is possible to imagine a world in which left-handers were the majority, in which the left-right of objects would be reversed. Pianos would have the bass strings on the right, violinists would take the bow with their left hand, scissors would cut in reverse. In fact, as Hermann Wey put it, "the laws of nature do not determine uniquely the one world that actually exists, not even if we conceded that two worlds arising from each other by automorphic transformation, i.e., by a transformation that preserves the universal laws of nature, are to be considered the same world" (Wey 1952, 27). In the same way, it is possible to imagine another world where the progression $T\text{-}D^7\text{-}S^6\text{-}T$ (instead of $T\text{-}S^6\text{-}D^7\text{-}T$ of classic tonality) would have served as the basis for the tonal system of classical music. All of these facts — that symmetry in music is an analogy, that even *natural asymmetries* may or may not be necessary, and that there is a cognitive distance between compositional and perceptual formalisms — have implications on the constitution of the rules of the game that give rise to the sonorities of music, because "the sonority is … essentially a formal matter." (Brelet 1947, 31).

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The Kantian concept of *critical rationality* holds that even though knowledge begins with experience, it does not emerge from experience. Knowledge has its genuine origin in the forms of intuition, schemes of imagination, and categories of understanding that reside *a priori* in human mind. For Kant, without these forms, schemes, and categories, without these transcendental determinants that are not experienced but function as an indispensable condition for the determination of knowledge within experience, knowledge would not be possible (Schrag, 1992, 2). If Greek philosophy considered that the human mind is rational as it participates in the rational structure of the cosmos — what Gadamer (1981, 81) called the "grand hypothesis of Greek philosophy" — for Kant the transcendental resources of reason remain within the limits of human

finitude.

In the model presented here, however, the determinants are transcendental only as they are pre-cogito, pre-logos, pre-rational:

— the *petite perceptions* and the auditory scene analysis serve to *categorise* the chaos of the world (figure-ground, ratios between frequencies perceived as distinguishable tonal "colours", etc.);

— the ratios between frequencies, that is, the *rhythms*, are the forms with which we order the percept (according to symmetries and asymmetries, or repetitions and distortions); and

— finally, there are recursive schemes — the ability, which is probably exclusively human, to fit one idea into another — which, according to Chomsky, characterises human language.

Unlike Chomsky though, I think recursion is pre-linguistic. Also, Corballis (2011, *passim*) takes recursion as *a mode of thought*, and the ability to retake episodes of the past and to imagine futures, and to fit imagined episodes into present consciousness, or into other imaginary episodes, as recursive operations. Both the ability to build up a constitutive element that contains a constituent part of the same type (Pinker and Jackendoff 2005, 230), and the temporal displacement, are fundamental to musical construction. Recursive processes and structures can, in principle, be extended without limit (and the concept of infinity derives from them), but in practice *they are limited by attention and memory (*Corballis 2011, 8).

The game of music: to side with is a form of not being disinterested

Whereas many attempts to rebuild music theory starting from fundamental cognitive data — such as Eugene Namour's "implication-realization" model (1992), or Ray Jackendorf's and Fred Lerdhal's "generative theory of tonal music" (1983) — are irrelevant to the creation of music, because, by limiting themselves to presupposing the need for learned patterns to perceive music, they end up by having voluntarily or involuntarily a normative character, the implications of a model for music that sees it as an *enlarged auditory scene analysis* are multiple.

First, it allows us to see the expressive character of music as an extension and — often — as a appeasement of the functions of the limbic system. Something that is very important for the theory

and the pedagogy of composition: it is in this way that the time of human perception finds its place in formalist systems, that is, from the observation that there is an expressive difference between the direct sound through the sense of the hearing; and the imaginative listening and memory, which are composer's tools.

Second, it allows us to do without the metaphor "music is language" and its implications, and choose a different metaphor, that of "music as a game" — a game that is built according to categorizations, rhythms (proto-symmetries) and recursive models — and to judge musical practices by distinguishing "the deck of cards from the game itself," in Umberto Eco's fortunate expression.[2] *Music as a game* allows us to distinguish two moments of its valuation; nevertheless, as what is communicated in music is a cognitive puzzle and the mandate to decipher it — a mandate that can, of course, be rejected — these two moments are indeed simultaneous. First, we can judge the totality of the rules of the game based on their latent potential (it would be good to use here the term "pregnancy" in its original etymological sense, but the word seems to have been kidnapped by its use in Gestalt theory): compare, for example, the tic-tac-toe to chess, or — as extreme as — the rules in operation in the music by Johann Stamitz with those by Bach. And to judge also as to their functionality: different uses of music will raise different levels of attention, and the set of rules must be adequate for its use.

Then, we can judge "how well" the creator "plays" the game. And as in all games, the evaluation of a particular interpretation of its set of rules — a piece of music — can be based on the principle of cogency. That is, — to paraphrase Carl Dahlhaus (1983, 160) — any interpretation that presents a higher degree of complexity — of imagination — and, at the same time, of integration and unity in a work, but without doing violence to the rules of the game, proves to be superior to other competing interpretations.

I can see two criticisms of this model, which I try briefly to consider here, that I would like to call chomskian and post-saussurian. For Chomsky,

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[2] The expression appears in the Brazilian translation — Umberto Eco, *A Estrutura Ausente* (São Paulo: Perspectiva/USP, 1971) — of its first Italian edition, *La Struttura assente: La ricerca semiotica e il metodo strutturale* (Milan: Bompiani, 1968); in the following Italian editions, Eco changes the text and the expression disappears, to resurface in Eco 1976. In this, the original English text was written by Eco himself. The Italian text is much clearer. In a few cases here I have retranslated from the the Italian text.

> It would be surprising indeed if we were to find that the principles governing these [linguistic] phenomena are operative in other cognitive systems, although there may be certain loose analogies, perhaps in terms of figure and ground, or properties of memory (...). Such examples illustrate ... that there is good reason to suppose that the functioning of the language faculty is guided by special principles specific to this domain ... (Chomsky 1980, 44).

In a more recent article (Hauser, Chomsky and Fitch 2002), Chomsky has continued to defend that the only specifically human facet in language is recursion — that is, to insert sentences within sentences. An aspect that would permit the unlimited extension of any natural language (recursion in language concerns syntax but also the morphology of words). There are several criticisms to this hypothesis by Chomsky, particularly regarding the exclusivity of recursion (for example, Pinker and Jackendoff 2005). What is suggested here, however, is that recursion would be at work before language. An argument in this direction is given by Daniel Everett's study (2005), based on over 30 years of field work with the Pirahã Indians in the Amazonia. The Pirahã grammar does not know the recursion, that is, all the semantic relationships that in other languages are transmitted by propositions composed of subordinations or coordination are transmitted in Pirahã by constructions in simple periods, formed by a single proposition, absolute, and connected by parataxis. In Pirahã, grammar does not allow "my brother's canoe is holed" to be said; one must say instead: "Brother has canoe; canoe has holes". If to the Pirahã this is possible, it is because there is already recursion at a level prior to the language and its grammar. Five years before Chomsky's birth, Manuel Said Ali, based on evolutionary grammar and on a less anglo-centric perspective, had said exactly this:

> In primitive language men used propositions one after the other, all of which had the form of principal expressions. The speech had a paratactic appearance. In this series of propositions there were certainly some who were subordinate to the others, who completed them, who determined them. *The difference was perceived from the sense, not from the form.* (1923, 53, emphasis added)

The second objection, which I would call post-Saussurian, could be expressed by the idea that music and language are ultimately indistinguishable because in the latter there would be no link between words and the co-occurring reality. As if it were possible, as happens with the theories of musical creation (counterpoint, harmony, etc.), to specify grammatical rules without any reference, explicit or implicit, to meaning (Tallis 1988, 72). This makes no sense: a grammar independent

from semantics exists only as an abstraction, not in the reality of language. If language were independent of semantics — if it did not refer to the world — music could also be language. However, as George Steiner points out, the research shows that even the most formal grammatical rules must take into account those aspects of semantics and *performance* which some, Chomsky included, would like to eliminate (Steiner 1992, 112). It is worth mentioning at length the neurologist Raymond Tallis:

> Behind the idea that language is somehow closed off from reality, so that it refers to nothing other than itself is a confusion between structure and event, between the system or institution and its use in discourse. The structure of the brain determines that the patterns of nerve impulses must have a significance — that they shall refer to or have as their intentional object the things and events that occasioned them. But those patterns of impulses are not themselves determined by the structure of the brain; they are not endogenously generated without regard to the world impinging on the brain. Structure, in other words ..., is a *condition* of the openness of the brain; it does not seal it off from reality but rather enables its response to extra-cerebral events. ... Analogously, the structure of language, which permits verbal sounds to become meanings, does not close speech off from extra-linguistic reality (1988, 78).

The post-Saussureanism of Barthes and Derrida arose from the understanding that when Saussure argued (1916/1974, 113) that "in language one can neither divide sound from thought nor thought from sound; the division could be accomplished only abstractedly, and the result would be either pure psychology or pure phonology", this would mean that the linguistic sign would be essentially a signifier, and the meaning, a referent (Tallis 1988, 69). Entangled in such a confusion, the signifier becomes so weakened that it is unable to reach its own meaning, not to mention an extra-linguistic referent proper (Tallis 1988, 89). José Guilherme Merquior is absolutely right when he says that

> Saussure envisioned the possibility of thinking about language within the entirety of the systems of signs; linguistics would then figure as a mere region of semiology. Barthes, asserting that every signification, verbal or otherwise, requires, to be interpreted, the mediation of language, proposed the inversion of this perspective: it is linguistics that should act as a key to semiology. (Merquior 1981, 196-7)

It is thus that Derrida in "Differance" states that the condition for signification — the principle of difference — concerns the totality of the sign, that is to say, both its meaning and its significant aspect. The problem with this complete split between meaning and signifier made by

Derrida is that meaning, becoming a question of difference, becomes an effect of language and cannot be expressed by it. Paradoxically and absurdly, language becomes a particular case of music. Notwithstanding, as Koopman and Davies (2001, 265) sensibly say,

> The special way musical ideas are presented, repeated, alternated, contrasted, and transformed in each musical work results in every work's presenting a complex whole of dynamics qualities, which is experienced by the listener as a unique Gestalt. This experience is ineffable; that is, it is finer-grained, subtler, and more complex than linguistic concepts and propositional structures are. That is no fault in language, though, which can perform the function of mediating and categorising the world only because it is not isometric with the direct perception of the world.

By doing away with the logocentric metaphor, we eliminate also the theoretical necessity of a stylistic foreknowledge. It is clear, as Bertrand Russell stated, that "understanding words does not consist in knowing their dictionary definitions, or in being able to specify the objects to which they are appropriate." (1921, 197-8). But it is not clear, following with Russell, that "understanding language is more like understanding *cricket*: it is a matter of habits, acquired in oneself and rightly presumed in others." Although still, as Russell says (ibid.), the use of a word comes first, and the meaning is to be distilled out of it by observation and analysis; meaning is certainly never absolutely definite — because it incorporates a greater or lesser degree of indeterminacy —; meaning is an area, a target; still so, *how to find a meaning in the world for cricket*? Or for music?

Even Leonard Meyer, who started from information theory but, by accepting from Russell the idea that a game is like a language, came to believe that "if meaning is to become objectified, it will as a rule become so when difficulties are encountered that make normal automatic behaviour impossible. In other words, given a mind disposed towards objectification, meaning will become the focus of attention, an object of conscious consideration, when a tendency or habit is delayed or inhibited" (1956, 39). That is, there would be emotion in music only through conscious attention to its structures — which is obviously wrong, just remember the dish that falls during sleep. Even before music, before consciousness, emotion depends on the structure we impose on the sound world.

Meyer had taken from Charles Sanders Peirce the idea that any regular response to an event is developed along with an understanding of the consequences of the event, of its meaning, and combined it with John Dewey's idea that if an answer were interrupted by an unexpected event, an

emotional reaction would have superimposed itself on the meaning of the event. With this Meyer developed a theory that considers the meaning of music to be emotion, which would be inversely equivalent to expectation in a specific cultural context. This would imply that "because expectation is largely a product of stylistic experience, music in a style with which we are totally unfamiliar is meaningless" (1956, 35) — which is also obviously wrong. Error led to the absurd in the affirmation of Willi Apel, of what "to regard an organum by Perotinus, a conductus of the 13th century, a motet by Machaut, an echo-fantasy by Sweelinck, or even Stravinsky's octet for wind instruments as expressive would simply render the term meaningless" (Apel 1969, 301). The emotional expressiveness of sounds, we have already seen, is much prior to the conventions of language. Because the "formal organization, intricate design, fascinating figurations, playful elements" (*ibid*.) are the very structure of music, Salvatore Sciarrino candidly says that "speaking of the expression denounces an ... affective problem. I give you an example. When does the problem of the washbasin arise? Only when the water does not arrive. The problem of expression does not concern the composer. The composer cannot fail to be expressive. Whatever he uses is expressive" (Polito 2003).

The Art of the Muses

> ... mere repetition is not poetry. He who shall simply sing, with however glowing enthusiasm, or with however vivid a truth of description, of the sights, and sounds, and odours, and colours, and sentiments, which greet him in common with all mankind — he, I say, has yet failed to prove his divine title. There is still a something in the distance which he has been unable to attain. We have still a thirst unquenchable, to allay which he has not shown us the crystal springs. This thirst belongs to the immortality of Man. It is at once a consequence and an indication of his perennial existence. It is the desire of the moth for the star. It is no mere appreciation of the Beauty before us — but a wild effort to reach the Beauty above. (Poe 1850/1909, 220)

In music, as in game, precisely because a conventional relationship with the world is superfluous, the rules are transmitted to those who attend by the very act of playing the game. The specific context is not cultural, but that *of the game itself*. The information provided by an unexpected event may be disruptive when the event is contrary to the rules played (let us not forget, however, that there are cases in which "we make up the rules, as we go along" — Wittgenstein, 1961, § 83, 156). Or it may not be disruptive — and in this case it is perceived as aesthetically charged — when it is an

extraordinary move that respects the rules. "Music as a game" — which has a long pedigree, from Mozart to Stravinsky — allows us to do without the contemporary sophism that beauty is in the eye of the beholder, in the sense that its determination depends on a class hegemony. In a game, of course, *interest prevents us from seeing its beauty*. To side with something is a form of not being disinterested, of giving the game a purpose, of considering it from a social and moral point of view. While nineteenth and twentieth centuries were those in which philosophy concentrated on power and hegemony, the Enlightenment of the previous century had seen detachment as a process of education towards a superior humanity, not as an alienation. Therefore, Kant's insistence that the first criterion for the judgment of taste was disinterest: an object is beautiful if I like it without any interest. However, it is clear that disinterest is an idealising process, not a given: we strive (by accepting different rules, different games) to recognise the historical nature of our aesthetic presuppositions — that is, their limits and mutability (Dahlhaus 1983, 55) —, so that we come back from this process of "controlled alienation" (as Habermas called it), having raised the particularity to universality.

"But if we say that something is beautiful, we attest to the presence of *a sign whose meaning is irreducible to the concept* and which, however, attracts and engages us, speaking to us about a Nature that speaks to us", says Mikel Dufrenne (1972, 47, added italics). For these cases, in which the nature of an expression is determined by the nature of the content, Umberto Eco created the concept of *ratio difficilis*: when an expression-token is directly accorded to its content (Eco 1976, 183). In the *ratio difficilis*, the expression is a type of content-nebula: these are discourses (including music) that have no satisfactory interpretants. Eco exemplifies this with a paradoxical poetic circle, in which every contemporary composer will recognise himself: he "has a fairly clear idea of *what* he would like to 'say' but does not know *how* to say it; and he cannot know *how* to do so until he has discovered *precisely what* to say" (ibid., 253). The content-nebula is the form of creativity in which rules are created and played with simultaneously; the expression occurs "according to *ratio difficilis*, and frequently cannot be replicated since the content, even expressed, cannot be analysed and recorded by its interpreters. Then the *ratio difficilis* regulates operations of institution of code" (p. 248): operations of invention.

Eco indicates that it is usually the addressee who chooses to interpret music as an invention, or as a stylisation. In the stylisation process, "certain apparently 'iconic' expressions" (i.e. those that,

for Peirce, "can represent their object above all by similarity") "... are in fact the result of a convention establishing that they will not be recognised because of their similarity to a content-model but because of their similarity to an expression-type which is not strictly compulsory and permits many free variants" (Eco 1975, 238). With the stylisation we no longer listen to *the* piece, but to the expression of a convention, dependent on a sub-code (for example, a "musical type (a march, 'thrilling' music, etc.)". It is the case of

> many a musical composition that, in different moments of each one's life, was enjoyed as a complex text that asked for adventurous, passionate interpretation of its less conventional features, is simply received, at a certain point, as one's ear becomes accustomed to it, as super-signs, and classified as «the Fifth Symphony», «Brahms' second» or quite simply as «Romantic music» or, in extreme cases, as «Music». (*ibid*., 303)

Stylisations "are *catachreses of previous inventions*," stresses Eco, "texts that had conveyed and could convey a complex discourse ... but indeed finish by almost taking on the function of proper names". However imprecise it may be, a replica of them is always accepted as a satisfactory occurrence and they are the proof that the *ratio difficilis*, by virtue of a continuous exposure to the process of communication and the needs of adaptation, generates a *ratio facilis*"(*ibid*.).

As it is of the essence of poetry that words are "urged to form unexpected and shocking alliances: the promontory shepherd, *the black bat night* ..."; that "the metaphor is presented in a raw state, in its most provocative form, when each word brutally changes its meaning by means of the other it clashes with, without we having the opportunity to develop or justify the comparison" (Dufrenne 1969, 54); that is to say, it is in this *ratio difficilis* that lies the invention of the poetic itself, it is symptomatic that Eco has chosen to describe as *catachresis*, its appeasement into *ratio facilis*. *Catachreses* are dead metaphors; ancient metaphors that are no longer perceived as such, of which "only the prick of the connecting tip can still be felt" (Tuve 1947, 132). The process is the one described by Kunst as "collapse in language". On the one hand, we must refrain from describing, with this *catachresis* of the faculty of creating a language given by metaphors, the integrality of our cognitive processes, as do cognitive scientists Douglas Hofstadter and Emmanuel Sander (2013, 3), who believe that "without concepts there would be no thought, and without analogies there would be no concepts". And, on the other, from finding in it the "meaning of

music," a belief in vogue and to which, for example, Raymond Monelle commits (2000, 15-17). This limited understanding of the mind excludes, respectively, human creativity and art, and it is for this reason that Eco insists on the necessity of the concept of *ratio difficilis* with his "critique of iconism" (1975, 187 and 189ss.).

In fact, there is a territory of iconic music, which serves as a generational marker. A music that *demands stylisation*, whose territory represents an emotionally striking experience for a group, which is defined by it; a territory, however, that will be extinguished with this generation. Who remembers, today, that Catulo da Paixão Cearense was once the most popular Brazilian songwriter? Or that Vicente Celestino, Silvio Caldas, were extremely popular singers? We listen to them, when we do, as aestheticisations of past objects of use; as we do, for example, with a charcoal clothes iron in an ethnographic museum. It is music that beats the time to the generations on earth.

However, there is something else that Eco leaves out because, like every semiologist, he treats a work as "a discourse that presupposes a certain code and an artist who speaks through the work" (Dufrenne 1972, 110); post-saussurian semiology,

> defines the significant whole according to the privileged model of language. It is a code for communicating messages, that is, to the exchange of meanings. Code and message are language and speech: therefore we apply to the whole the distinction that, since Saussure, informs the entire linguistic operation and warrants it the dignity of a science (Dufrenne 1972, 104-5).

But prior to language, music. Music shows us that we communicate not only with signs and languages built with them, but also with puzzles contained in the messages exchanged. Enigmas, by being solved repeatedly, wear out, and may collapse in language. The enigma, though, can be beatific for itself: we gather infinite pleasure playing music to ourselves, like a child playing alone with his world — no language involved… Moreover, there is an immense number of music that have in their very structure the antidote against the decay in *ratio facilis*: their enigmas contain requests in excess to our short-term memories and attention, but not to the point of conforming inhospitable territories. Even if we want to get used to them, even by means of "a continuous exposure to communication and successive conventions", their enigmas are projected, renewed, with a new listening. They are territories that may be renewed by other paths that traverse them, that may be continuously re-functionalised, as signs that refuse to have their meaning reduced to

the concept — definition, which I borrow from Dufrenne, of the beautiful thing. A music that demands eternity. As a geologist, I also know that the day will come when the pyramids of the Valley of the Kings will join the dust of the desert, in which the *Odyssey*, the *Art of the Fugue* will disappear; but the music in its *ratio difficilis*, the art of the Muses, is — along with the other arts — a desperate attempt by man to sign a small scratch with his fingernail, on this sphere of polished steel of infinite radius that is time; of the moth desiring the stars.

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